



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/594,458

09/26/2006

Hideki Sato

129546

9288

25944 7590 09/15/2008

OLIFF & BERRIDGE, PLC

P.O. BOX 320850

ALEXANDRIA, VA 22320-4850

EXAMINER

VINH, LAN

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

09/15/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/594,458	Applicant(s) SATO, HIDEKI	
	Examiner LAN VINH	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5 and 9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5, 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 6/18/2008 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, the applicants argue that Gantley provides no reason or rationale for adjusting the etching solution as claimed and Gantley does not disclose adjusting the etching solution to adjust the etching rate to be 100 nm/min or less, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case since the rejection of claim 5 based on a combination of Gantley and Seki and Seki serves as an evidence that the concentrations of the etchants in the etching mixture vary to effect the etching rate, one skilled in the art at the time the invention was made would have found it obvious to vary the concentration of the acids, iodine in Gantley etching solution by conducting routine experimentation in order to achieve any desirable etching rates including the claimed etching rates because it is noted that result-effective variable can be optimized MPEP 2144.05 IIB

The applicants argue that Gantle nowhere teaches electrical resistivity of the silicon. This argument is unpersuasive because Gantley discloses that the silicon wafer is in crystalline form (col 2, lines 50-53), which reads on the silicon wafer has electrical resistivity of 1 ohm.cm or less since the applicants discloses in page 11 of the instant

Art Unit: 1792

specification that silicon single crystal wafer has electrical resistivity of 0.01-1 ohm.cm

and it is noted that section 2111 of the MPEP states :"[R-5] Claim Interpretation;

Broadest Reasonable Interpretation

CLAIMS MUST BE GIVEN THEIR BROADEST REASONABLE

INTERPRETATION

During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." >The Federal Circuit's en banc decision in Phillips v. AWH Corp., 415 F.3d 1303, 75 USPQ2d 1321 (Fed. Cir. 2005).

It is argue that Gantley teaches neither the problems nor the effect that are described in the claimed invention as mentioned above, page 5 of the response filed on 6/18/2008.

This argument is unpersuasive because it is not in commensurate with the scope of claim 5 because claim 5 does not recite neither the problem nor the effect as disclosed in the instant specification

In response to applicant's argument that there is no suggestion to combine the references of Gantley and Seki because the object for etching taught in Seki is a photoresist and not silicon and Seki teaches away from the features of amended claim 5 by denying the inclusion of the acidic acid in etching solution. This argument is unpersuasive because Seki discloses the etching rate of silicon using an etching solution includes HF (col 5, lines 19-30)

Claim Rejections - 35 USC § 103

Art Unit: 1792

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engeler (US 3,558,375) in view of Seki et al (US 5,409,569)

Engeler discloses a method of fabricating semiconductor structure. The method comprises:

etching a surface of the silicon wafer by immersing the wafer in an etching solution, the etching solution comprises 160 cc acetic acid, iodine, 280 cc nitric and 50 cc HF (col 6, lines 37-40, col 7, lines 21-25), which reads on the etching solution is a mixture of hydrofluoric acid, nitric acid, acetic acid and water further including iodine or iodide, in which a volume ratio of nitric acid in the etching solution is the largest among volume ratios of hydrofluoric acid, nitric acid, acetic acid and water, observing etched patterns on the surface of the wafer (col 6, lines 28-32), which reads on observing etch pits formed on the etched surface of the wafer, the silicon wafer has electrical resistivity of about 0.05 ohm-cm (col 6, lines 1-5), which reads on the claimed resistivity of 1 ohm-cm or less.

Unlike the instant claimed inventions as per claims 5, 9, Engeler fails to specifically disclose that the etching solution includes hydrofluoric acid : nitric acid : acetic acid : water in a volume ratio of 1 : 13-17 : 4-8 : 4-8 and a removal amount/etching rate of the surface of the silicon wafer is 50 nm or more

Art Unit: 1792

Seki, in a semiconductor manufacturing method, discloses using an etching solution comprises HF, nitric acid, acetic acid, the concentration of the acids vary, iodine containing etchant requires nitric acid of higher concentration (col 2, lines 20-50), changing the concentration/a variable of HF and iodine in the etching solution to effect the etch rate/a recognized result of silicon (col 6, lines 10-20). Thus, Seki serves as an evidence that changing the concentration of the elements of the etching solution/parameters according to the material being etched appears to reflect a result-effective variable. One skilled in the art at the time the invention was made would have found it obvious to vary the concentration of the acids, iodine in Gantley etching solution by conducting routine experimentation in order to achieve any desirable etching rates including the claimed rates because it is noted that result-effective variable can be optimized MPEP 2144.05 II B

3. Claims 5, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tiemann et al (US 3,772,102) in view of Seki et al (US 5,409,569)

Tiemann discloses a method for transferring a desired pattern in silicon to a substrate layer. The method comprise:

etching a surface of the silicon wafer by immersing the wafer in an etching solution, the etching solution comprises 3 parts acetic acid, iodine, 5 parts nitric and 3 parts HF (col 3, lines 59-67; col 4, lines 1-5), which reads on the etching solution is a mixture of hydrofluoric acid, nitric acid, acetic acid and water further including iodine or iodide, in which a volume ratio of nitric acid in the etching solution is the largest among volume

Art Unit: 1792

ratios of hydrofluoric acid, nitric acid, acetic acid and water, observing etched patterns on the surface of the wafer (col 4, lines 19-25), which reads on observing etch pits formed on the etched surface of the wafer, the silicon wafer is in crystalline form (col 3, lines 25-30), which reads on the silicon wafer has electrical resistivity of 1 ohm.cm or less since the applicants disclose in page 11 of the instant specification that silicon single crystal wafer has electrical resistivity of 0.01-1 ohm.cm.

Unlike the instant claimed inventions as per claims 5, 9, Tiemann fails to specifically disclose that the etching solution includes hydrofluoric acid : nitric acid : acetic acid : water in a volume ratio of 1 : 13-17 : 4-8 : 4-8 and a removal amount/etching rate of the surface of the silicon wafer is 50 nm or more. Seki, in a semiconductor manufacturing method, discloses using an etching solution comprising HF, nitric acid, acetic acid, the concentration of the acids vary, iodine containing etchant requires nitric acid of higher concentration (col 2, lines 20-50), changing the concentration/a variable of HF and iodine in the etching solution to effect the etch rate/a recognized result of silicon (col 6, lines 10-20). Thus, Seki serves as an evidence that changing the concentration of the elements of the etching solution/parameters according to the material being etched appears to reflect a result-effective variable. One skilled in the art at the time the invention was made would have found it obvious to vary the concentration of the acids, iodine in Tiemann etching solution by conducting routine experimentation in order to achieve any desirable etching rates including the claimed rates because it is noted that result-effective variable can be optimized MPEP 2144.05 II B

Art Unit: 1792

4. Claims 5, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gantley (US 3,960,623) in view of Seki et al (US 5,409,569)

Gantley discloses a semiconductor etching method. The method comprises etching a surface of the silicon wafer by immersing the wafer in an etching solution, the etching solution comprises acetic acid, iodine, nitric and HF (col 3, lines 49-65), which reads on the etching solution is a mixture of hydrofluoric acid, nitric acid, acetic acid and water further including iodine or iodide, observing etched portions of a semiconductor bodied (col 4, lines 10-14), which reads on observing etch pits formed on the etched surface of the wafer, the silicon wafer is in crystalline form (col 2, lines 50-53), which reads on the silicon wafer has electrical resistivity of 1 ohm.cm or less since the applicants discloses in page 11 of the instant specification that silicon single crystal wafer has electrical resistivity of 0.01-1 ohm.cm. Unlike the instant claimed inventions as per claims 5, 9, Gantley fails to specifically discloses that the etching solution includes hydrofluoric acid : nitric acid : acetic acid : water in a volume ratio of 1 : 13-17 : 4-8 : 4-8 and the removal amount of the surface of the silicon wafer by etching/silicon etching rate is 50 nm or more.

Seki, in a semiconductor manufacturing method, discloses using an etching solution comprises HF, nitric acid, acetic acid, the concentration of the acids vary, iodine containing etchant requires nitric acid of higher concentration (col 2, lines 20-50), changing the concentration/a variable of HF and iodine in the etching solution to effect the etch rate/a recognized result of silicon (col 6, lines 10-20). Thus, Seki serves as an evidence that changing the concentration of the elements of the etching

Art Unit: 1792

solution/parameters according to the material being etched appears to reflect a result-effective variable. One skilled in the art at the time the invention was made would have found it obvious to vary the concentration of the acids, iodine in Gantley etching solution by conducting routine experimentation in order to achieve any desirable etching rates including the claimed rates because it is noted that result-effective variable can be optimized MPEP 2144.05 II B

5. Applicant's amendment necessitated the new ground(s) of rejection of claims 5, 9 presented in this Office action (the inclusion of the limitations of claims 6 and 8 into claim 5 changes the scope of claim 5 as well as the scope of dependent claim 9). Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Conclusion

Art Unit: 1792

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAN VINH whose telephone number is (571)272-1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lan Vinh/
Primary Examiner, Art Unit 1792

Application/Control Number: 10/594,458

Page 10

Art Unit: 1792

.